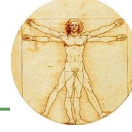


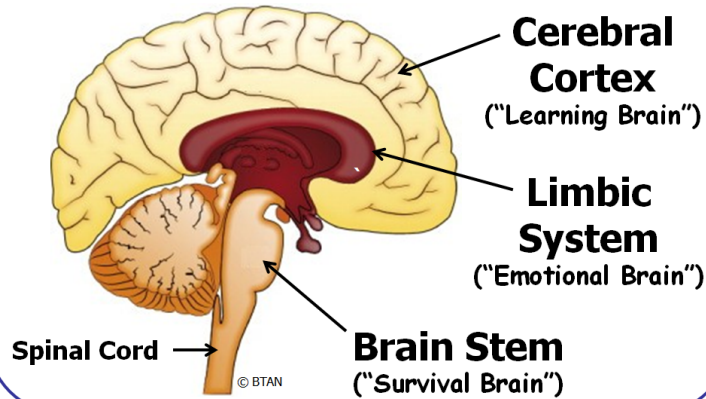


## OUR EVOLVING BRAIN



Our brain evolved over millions of years into **3 main layers**:

### HUMAN BRAIN

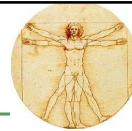


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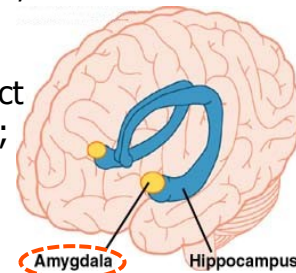
## THE LIMBIC SYSTEM (Emotional Command Center)



- Deep within the brain's emotional command center there is a tiny structure called the **AMYGDALA**;
- AMYGDALA scans all environmental and bodily sensations for signs of potential threats and danger to the organism;
- Triggering feelings of discomfort, frustration, anxiety, anger, fear, panic – "fight, flight, or freeze" reaction to protect organism from harm;

### Paradoxical Role of the Amygdala:

- Serves as the "**Body Guard**" to protect the organism from threats and danger;
- "**Terrorist**" if unnecessarily aroused, leading to stress and discomfort.

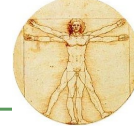


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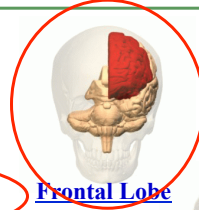
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## OUR LEARNING BRAIN



- ✓ Attention system, Long Term Memory
- ✓ Logic, Critical thinking
- ✓ Lateral thinking (creativity & imagination)
- ✓ Decision making, Goal setting, Planning
- ✓ Judgment, Reasoning, Rationalizing



Frontal Lobe



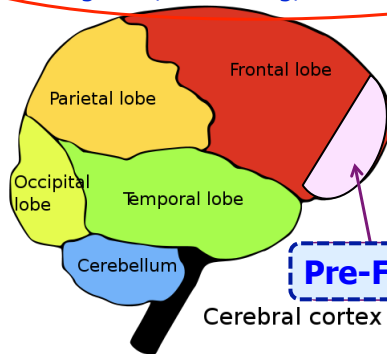
Parietal Lobe



Temporal Lobe



Occipital Lobe



Pre-Frontal Cortex (PFC)

Cerebral cortex

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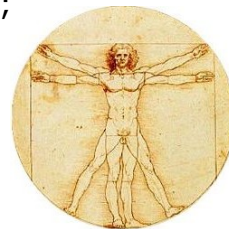


## MENTAL EXPERIENCE



### THREE PARTS OF MENTAL EXPERIENCE:

- **Viññāna** : Process of Perception ("perception")
  - what is perceived through the sense organs;
- **Mano** : Cognitive Process ("intellect")
  - categorized interpretation of perception giving meaning to what was perceived;
- **Citta** : Affective Process ("emotion")
  - pleasant & unpleasant feelings arouse the emotions, leading to emotional excitement and reactions;
  - personalizing the experience with the notion there is a "self" to be affected.

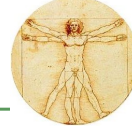


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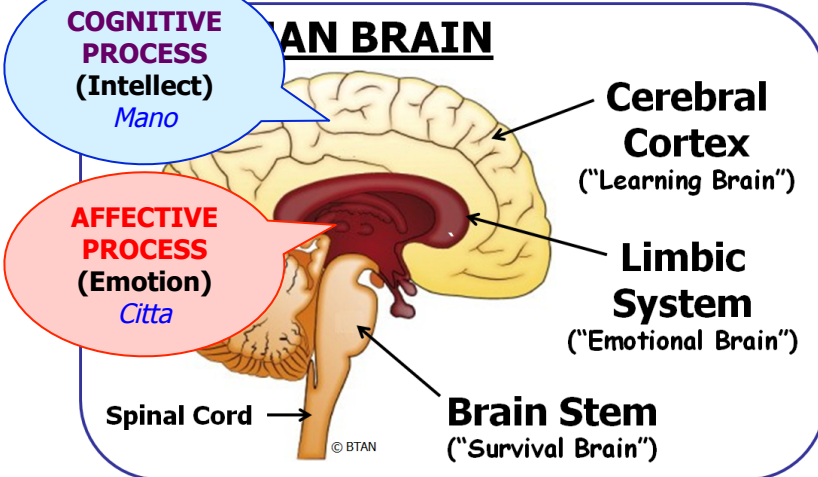
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## OUR EVOLVING BRAIN



Our brain evolved over millions of years into **3 main layers**:



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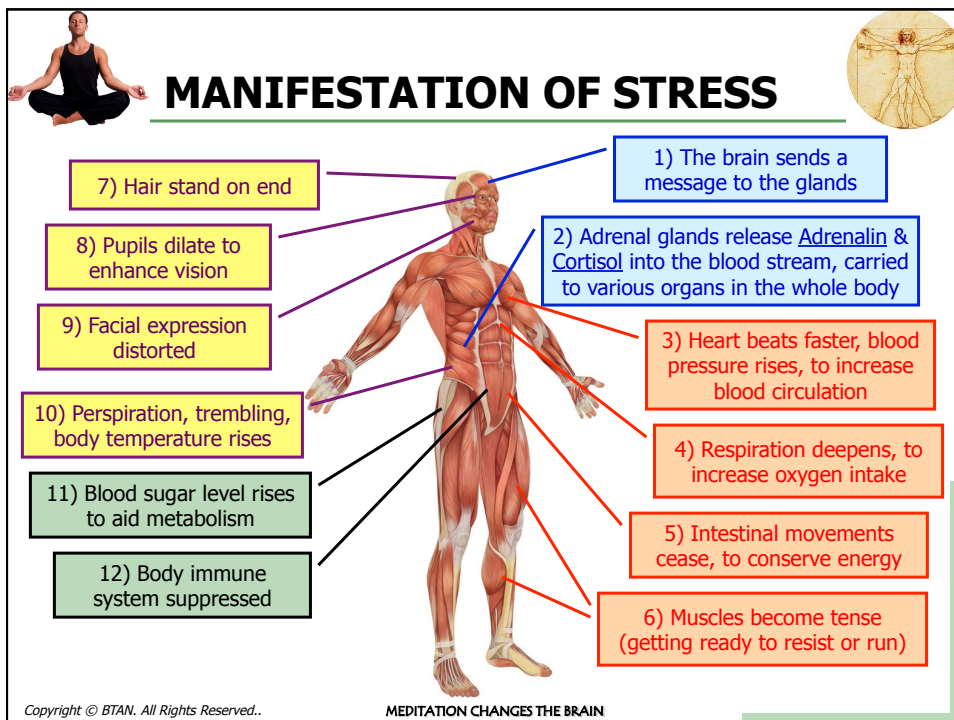
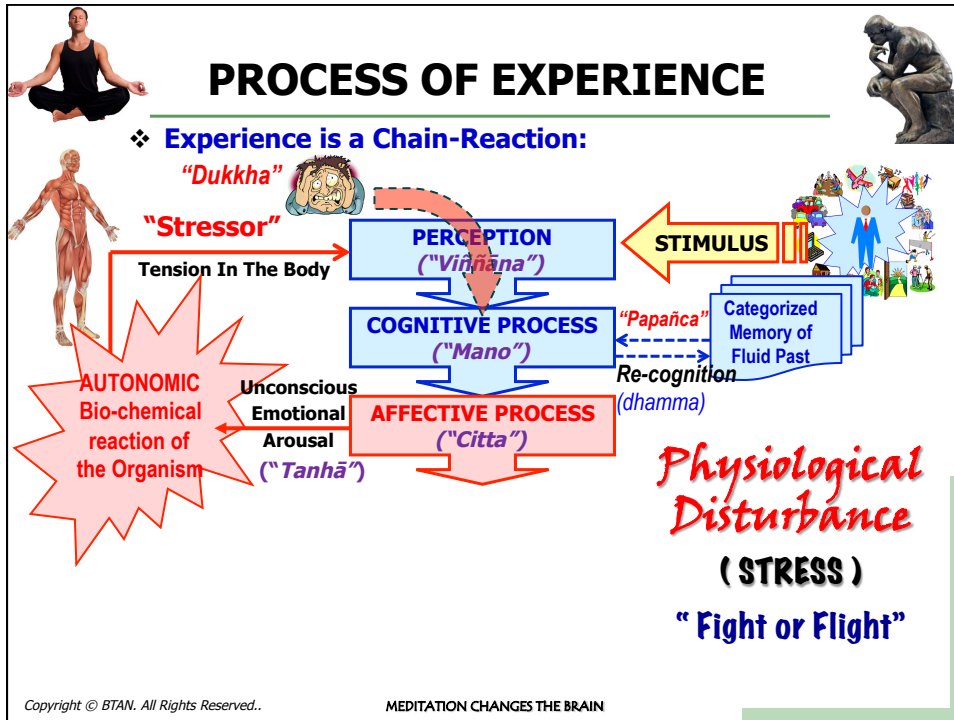
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**Cultivation of  
Tranquility &  
Attain Insight  
Into Realities**

Abandon all evil ways,  
Enter the good life,  
Purify one's mind  
~ this is the teaching  
of the Buddhas.  
( Dhammapada verse 183 )

Sabbapāpassa akaraṇaṃ,  
Kusalassa upasampadā,  
Sacitta pariyodapanam ~  
Etaṃ Buddhāna' sāsanaṃ.







# STRESS HORMONES



## ADRENALIN

- Epinephrine or "Adrenalin" is the "action hormone", preparing the body for action:
  - dilates air passages and increases respiratory rate
  - increases heart rate and blood pressure
  - dilates pupils
  - tenses skeletal muscles

## CORTISOL

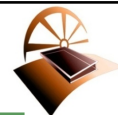
- Hydrocortisone or "**Cortisol**" is the "stress hormone", mobilizing body's energy resources in reaction to "threats":
  - increases blood sugar level
  - suppresses the immune system
  - suppresses the digestive system
  - decreases bone formation

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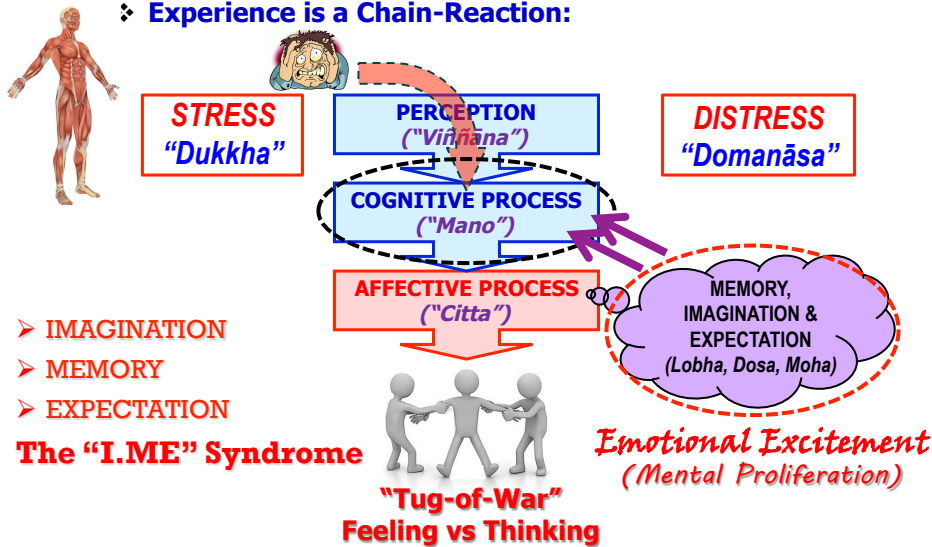
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# PROCESS OF EXPERIENCE



❖ Experience is a Chain-Reaction:



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## Self-Affliction of Mental Suffering

“Whatever harm one enemy may do to another, or one hater to another, an ill-directed emotions inflicts on oneself a greater harm.” (Dhammapada 42)

Emotions dominate the world,  
emotions create distress;  
Emotion is that one thing,  
to which all are spellbound.


**Cittena nīyati loko  
cittena parikassati –  
Cittassa ekadhammassa  
sabbeva vasamanvagūti**

(SN I.62 – Citta Sutta)


Manopubbangamā dhammā –  
manosetthā manomayā . . .

(Dhammapada verse #1)

Cognition precedes all experiences –  
It predominates and creates all realities...



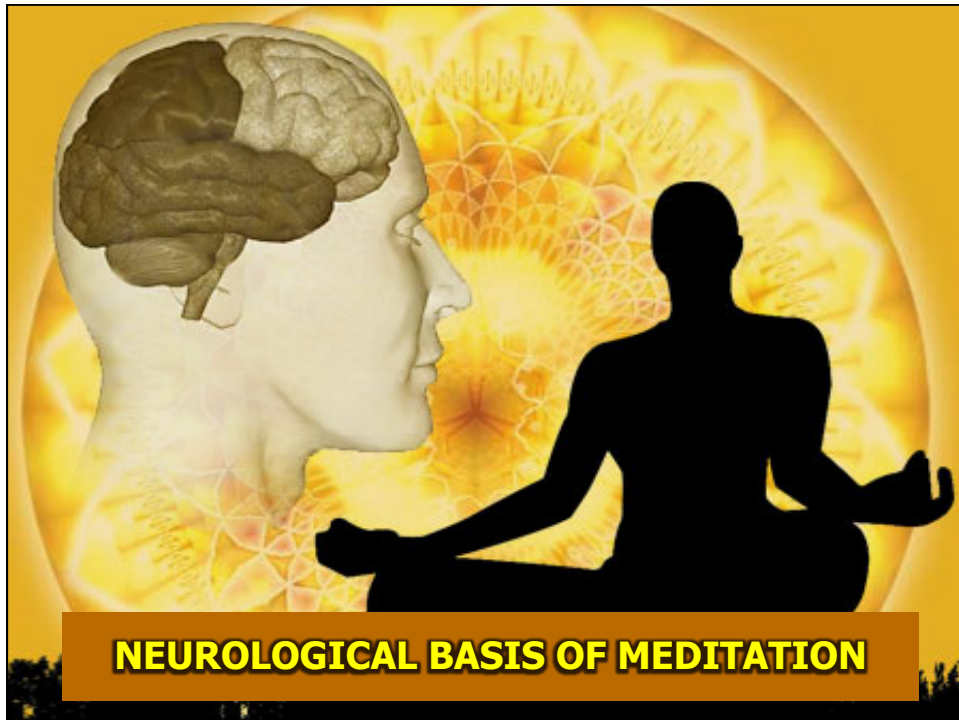
## Brain Components Affected By Meditation



- CEREBRAL CORTEX** – Learning brain responsible for conscious rational thoughts – “**cortical**”;
- PRE-FRONTAL CORTEX (PFC)** – critical thinking part of the brain responsible for decision making, goal setting, planning, judgment, reasoning, regulation of emotions;
- LIMBIC SYSTEM** – emotional command center of the brain responsible for mood, temperament, emotional excitement and reaction – “**sub-cortical**”;
- AMYGDALA** – fear control center responsible for fear and panic processing – the “body-guard” as well as “terrorist” in the brain.

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## ASPIRATION OF SELFLESSNESS

- The aspiration to relieve suffering reduces activation in the Amygdala;
- People differ in their skill level at voluntary down-regulation of **negative affect**, as reflected in the decreased activation of the Amygdala, which is accompanied by increased activation in the Ventromedial Pre-frontal Cortex.



## MEDITATION CHANGES THE BRAIN Dr. Richard Davidson

1. People differ in trait levels of happiness and other virtuous traits such as compassion;
2. Emotion regulation plays a key role in modulating individual difference in happiness and resilience;
3. Happiness and compassion can be regarded as the product of **skills** that can be enhanced through mental training.



## EMOTIONS

- Emotion is governed by a distributed neural circuitry that includes both cortical (cerebral cortex) and subcortical (limbic system) components...
- ...and the brain circuits of emotion have bidirectional communication with the body including the autonomic, endocrine and immune systems.



## MEDITATION

- A very general hypothesis is that meditation strengthens **cortical regulatory circuitry** that in turn modulates the dynamics of limbic reactivity.




## CORTISOL REGULATION

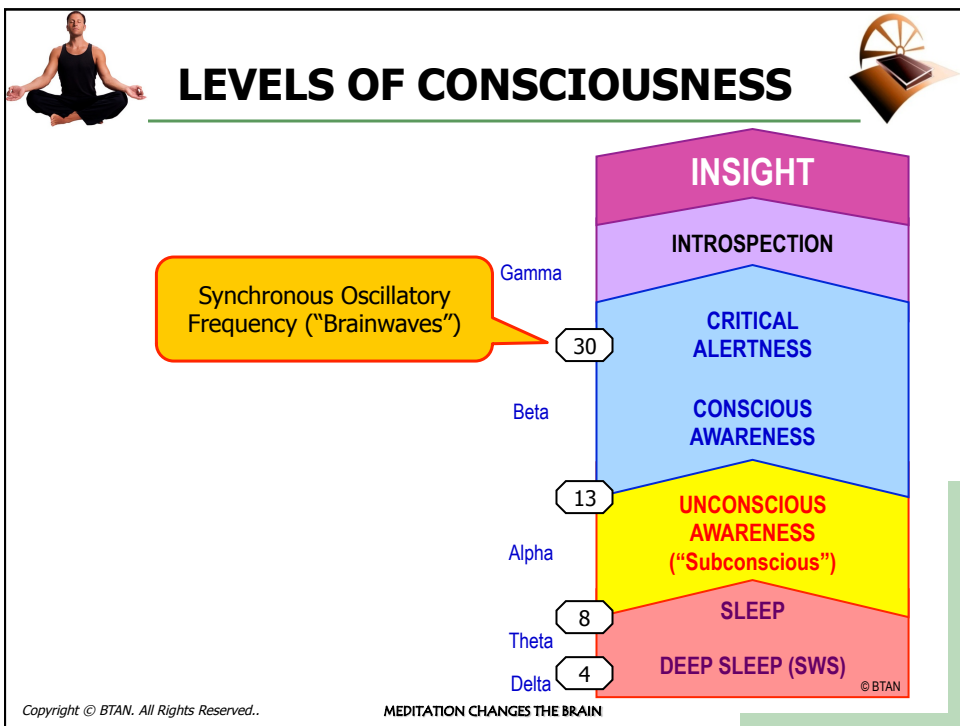
- Better emotion regulators as reflected in less Amygdala and greater vmPFC activation show a greater decrease in **cortisol** at the end of the day.

# “BRAINWAVES”

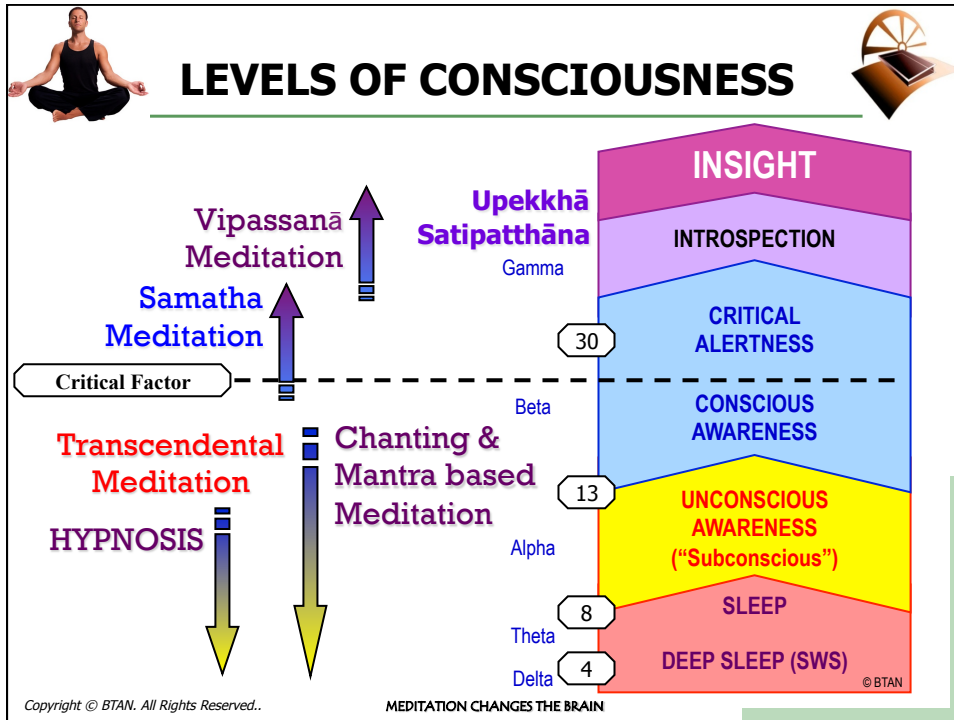
## Synchronous Oscillatory Frequency

(EEG: Electroencephalography)









**MIND & LIFE INSTITUTE**

## IMPACT OF MEDITATION

- Meditation is associated with marked increases in electrophysiological signs (EEG) of activation (gamma range) in the **Prefrontal Cortex** (PFC) and synchrony between the prefrontal cortex and other brain regions in **long-term practitioners**.



## HAPPINESS & COMPASSION AS SKILLS

1. People differ in trait levels of happiness and other virtuous traits such as compassion;
2. Emotion regulation plays a key role in modulating individual difference in happiness and resilience;
3. Happiness and compassion can be regarded as the product of **skills** that can be enhanced through mental training.





## Secret of Wellness and Happiness



### PAST: **FORGIVENESS**

- Look back with forgiveness... **Oxytocin** is released, the hormone of empathy and bonding, boosting the immune system.

### FUTURE: **ENTHUSIASM**

- Look forward with enthusiasm, **Dopamine** and **Serotonin** are released... hormones of energetic reward anticipation, and attention & concentration. Deficiency in Dopamine may lead to Parkinson's disease, while deficiency in Serotonin may lead to mood swings, bipolar syndrome, depression and even Alzheimer's disease,.

### PRESENT: **GRATITUDE**

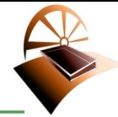
- Look around with gratitude, being thankful for one's blessings... **Endorphin** is released, a powerful natural painkiller hormone that heals physical and emotional pain, while boosting the immune system.

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MEDITATION CHANGES THE BRAIN



## MENTAL TRAINING



- Humans are endowed with a capacity to voluntarily regulate emotion and this competence can be learned;
- The importance of mental training:
  - Happiness and compassion as **skills**
  - ( **Skills = conscious rational activities turning into habitual competencies – HARMONIOUS EXERCISE** )
  - Transforming the mind/brain will also affect the **body**

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## PARAPHRASED SUMMARY



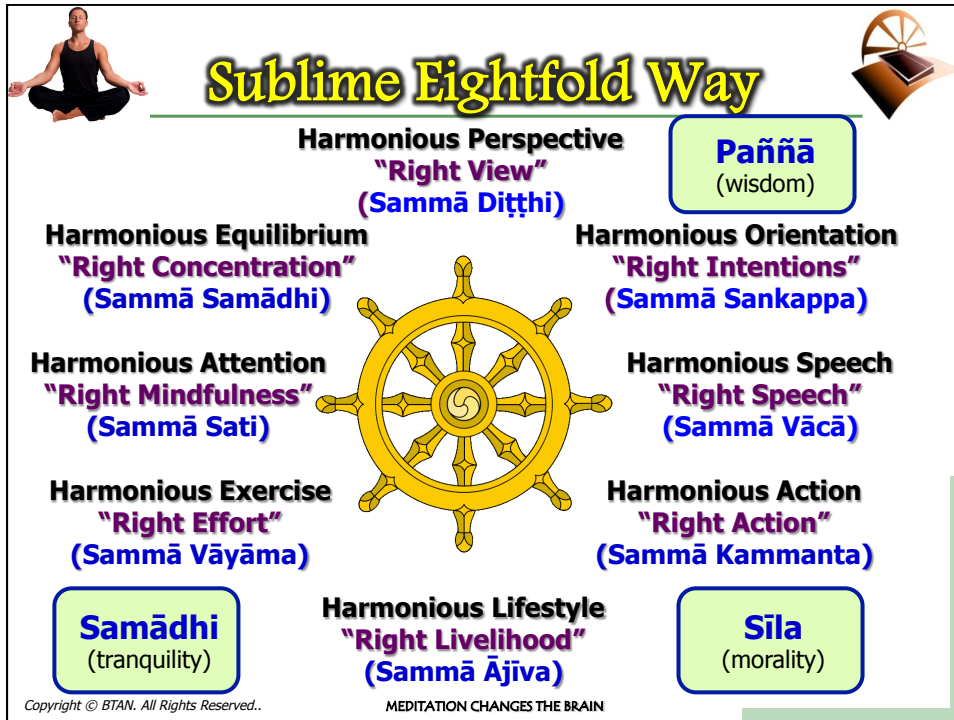
- ① Aspiration to heal others of suffering makes us less emotional;
- ② Meditation is the mental training to help regulate emotions;
- ③ By reducing activation of the Amygdala;
- ④ By increasing activation in the Pre-Frontal Cortex;
- ⑤ Meditation strengthens brain circuits involved with emotion regulation;
- ⑥ Meditation reduces the level of cortisol stress hormone in the body;
- ⑦ Meditation raises brainwave in PFC to gamma range and improves synchrony between PFC and rest of the brain – higher brainwave frequency means sharper cognition and more luminous mind;
- ⑧ Emotion regulation affects individual's happiness and resilience;
- ⑨ Happiness and compassion are the product of skills that can be enhanced through mental training.

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MEDITATION CHANGES THE BRAIN







**"MEDITATION" (Bhāvanā)**

❖ **Ariyamagga Bhāvanā:**  
Cultivation of the **Sublime Eightfold Way** according to the original teachings of the Buddha as stated in the **Sutta-Vinaya;**

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## VARIATIONS & DISTORTIONS



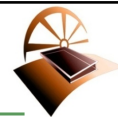
- ❖ Individual (personalized) interpretations and variations to the teachings of the Buddha, with **modified** philosophy, methods and techniques (departure from Ariyamagga Bhāvanā);
- ❖ Variations arising from latter day commentaries;
- ❖ Localized variations from geographical & cultural differences;
- ❖ Variations from ancient traditional shamanism, trantrism, ascetism, yogic, and various others;
- ❖ Transcendental Meditation (**TM**)... etc.

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## BHĀVANĀ CULTIVATION



There are 2 stages of Bhāvanā cultivation:

- I. Cultivation of Tranquility (*Samatha-bhāvanā*)
- II. Cultivation of Insight (*Vipassanā-bhāvanā*)

Tranquillity (*Samatha*) is **relaxation of body**, and **cessation of affective process** (citta), stopping all emotional excitement & reactions.

Insight (*Vipassanā*) is the unshaken **wisdom** (*paññā*) into the unstable (*anicca*), insecure (*dukkha*) and impersonal (*anattā*) three-fold realities of life, and full comprehension of **The Four Noble Truths**.

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## DEFINITIONS OF SAMATHA & VIPASSANA

### SAMATHA → Samādhi

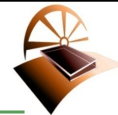
- Stilling (of *citta*), settlement, calmness, tranquility of mind (mental equilibrium);
- Cognitive Consonance (*samādhi*) – unified mind;
- Culminating in “**stillness of mind**”.

### VIPASSANA → Paññā

- vi = clear, distinct, distinguished;
- passana = seeing;
- Culminating in “**distinct seeing**” – **wisdom**

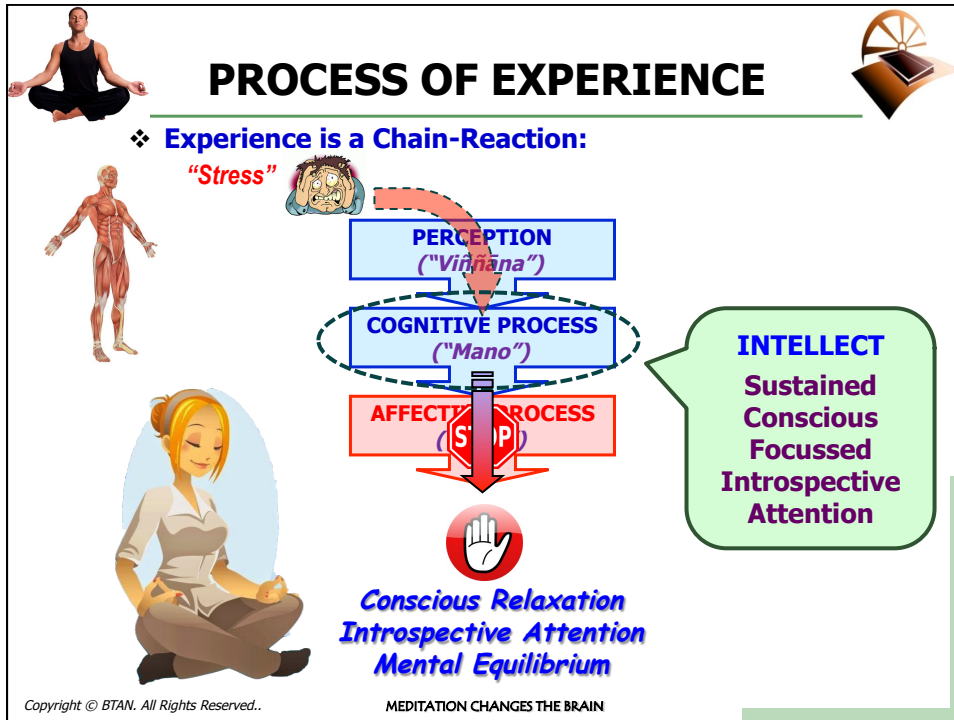


## Stages To Awakening



“Monks, when **Attentiveness to Breathing** (*Ānāpānasati*) is cultivated and developed, it is of great benefit and great reward. It helps eliminate the five hindrances (*pañca nīvarana*)” (**Ānāpānasati Sutta**).

- I. Ānāpānasati** when cultivated and developed leads to the fulfillment of the **Four-Fold Introspection** (*satipatthāna*);
- II. Satipatthāna** when cultivated and developed leads to the fulfillment of the **Seven Steps To Awakening** (*satta bojjhangā*);
- III. Satta Bojjhangā** when cultivated and developed leads to the fulfillment of **Full Comprehension** (*paññā*) and **Emancipation** (*vimutti*);



- 
- CONSCIOUS RELAXATION**
1. RELAX THE BODY: *Conscious Relaxation*
    - Bio-chemical activities gradually subside;
    - Tension in the body eases;
    - Mind no longer disturbed by tension in the body.

*A relaxed body is a necessary condition for a calm mind!*
  2. CALM THE MIND: *Introspective Attention*
    - Relaxed body suggests absence of threats;
    - Conscious focused introspective attention;
    - No mental proliferation – the mind calms down;
    - Stilling all emotional arousal & excitement ("citta").
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## Harmonious Exercise (Right Effort) (*Sammā-vāyāma*)



### FOUR HARMONIOUS STEPS

(*Cattāri Sammā Padhāna*):

- I. **PREVENTION** (*samvara*) – prevent arising of unarisen unwholesome states;
- II. **ABANDONMENT** (*pahāna*) – abandon unwholesome states that have already arisen;
- III. **CULTIVATION** (*bhāvanā*) – cultivate wholesome states that have not yet arisen;
- IV. **MAINTENANCE** (*anurakkhana*) – maintain and perfect wholesome states that have already arisen.

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- ✧ There is no ecstasy (*jhāna*) for one who has no insight (*paññā*)
- ✧ There is no insight (*paññā*) for one who has no ecstasy (*jhāna*)
- ✧ One who has both ecstasy (*jhāna*) and insight (*paññā*)...  
...is in the proximity of **Nibbāna**.

(Dhammapada verse #372)

## BENEFITS OF MEDITATION

- ✓ Slow down heartrate
- ✓ Improve blood circulation
- ✓ Lower blood pressure
- ✓ Enhance immune system
- ✓ Calm anger, fear, anxiety
- ✓ Relieve depression
- ✓ Abandon emotional excitement
- ✓ Tame lust, hatred, delusion
- ✓ Cultivate introspection
- ✓ Develop cognitive consonance
- ✓ Instill mental equilibrium
- ✓ Attain insight into realities



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